# THE FEASIBILITY OF INTERCROPPING PEA WITH CANOLA, MUSTARD AND BARLEY

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## ABSTRACT

An intercropping trial was conducted in the summer of 1988 to compare pea intercrops with Tobin and Westar canola, yellow mustard, and barley. At two sites, a number of different pea varieties were intercropped with canola, mustard, and barley, and compared to monocrops of each. At four sites, a seeding rate trial was conducted with Westar canola and barley intercrops with Trapper pea. Measurements to assess the success of the intercrop included grain yield, land equivalent ratio (LER), grain nitrogen yield, and economic return.

In the variety trial, intercropping reduced the yields of both component crops, and the LER was not significantly higher than 1 in any case. There were significant differences in economic return for the crop. Intercropping did not increase the $/ha return, while pea monocrops provided the greatest income. Significant differences in grain N yield were also observed, with pea varieties being highest. Little or no increase occurred in grain N yield when pea was intercropped with barley.

In the seeding rate trial, intercropping again did not benefit yield nor economic return. Some benefit resulted from intercropping barley with pea, as this increased the grain N yield as compared to monocropped barley.

Although neither yield nor economic return was consistently increased by intercropping, other benefits to the pea were noted. Lodging of pea was reduced, especially when intercropped with mustard or Westar canola. This could facilitate harvest, and reduce associated grain loss. In addition, the pea crop would be less subject to pre-harvest weather damage, thus producing a higher quality crop.

## INTRODUCTION

Farmers have begun intercropping pea with non-legumes to facilitate harvest of the pea crop. Pea tend to lodge heavily after abundant growth, but with the support of intercropped canola or mustard lodging is much reduced and mechanical harvesting remains possible with reduced losses.

In addition to the physical support the non-legume provides the pea, several other benefits of intercropping are possible. For example, higher N content in the intercropped non-legume component than the the monocropped non-legume has been observed (Eaglesham et al., 1981; Vasilas and Ham, 1985). This is of particular interest for farmers who intercrop barley with pea for feeding purposes to increase total protein content of the mixture. Furthermore, higher water use efficiency was found for intercropping as compared to monocropped systems (Hulugalle and Lal, 1986). Higher $N_2$-fixation rates have been observed for intercropped legume (Morris and Weaver, 1987; Danso et al.,

1987) but the increase in $N_2$-fixation under Saskatchewan conditions was found to be marginal or non-existent (Cowell et al., 1989).

Many pea varieties are available, each which its own characteristics. Some varieties mature earlier than others (Princess), have different growth habits (Tipu, a new semi-leafless variety), or have higher grain yield potential and percentage N content. It is desirable that the legume and non-legume components mature simultaneously which makes the choice for the non-legume support crop crucial.

Seeding rates of the two crops also becomes crucial to prevent excessive competition of either the legume or the non-legume. If the seeding rate of the non-legume is too high, the non-legume can easily out-compete the legume and the yield of the legume will be substantially reduced.

The objective of this study, conducted in 1988, was to investigate the feasibility of intercropping various pea varieties with two canola varieties, mustard, or barley. Furthermore, different seeding rates of pea and barley and pea and canola were tested at four sites.

## MATERIALS AND METHODS

At Glenavon and Star City, 24 cropping systems were tested to evaluate different combinations of six pea varieties and canola, mustard and barley (Table 1). At four sites (Glenavon, Melville, Canora, and Star City) pea and Westar canola or pea and barley were monocropped or intercropped at three different seeding rates (Table 1). Sites were chosen on fields previously cropped to cereals and were cultivated before seeding. Pea and barley were seeded with a double disc drill with a row spacing was 17.5 cm. Canola and mustard were mixed and broadcast with the N and P fertilizer, then harrowed and packed. Seeding rates are reported in Table 1. Fertilizer was applied at a rate of 64 kg N/ha and 29 kg $P_2O_5$/ha and consisted of a mixture of ammonium nitrate and monoammonium phosphate. Treatments were laid out in a randomized complete block design, replicated 4 times.

At all sites, weed control was carried out with herbicides (diclofop methyl) or by hand. Spraying was repeated when necessary. Additional weed control in the non-barley plots at Star City was carried out with sethoxydim and plots were sprayed with malathion. To control flea beetles at Glenavon, Melville, and Star City.

At physiological maturity, a 6 $m^2$ area was harvested and the crop was air dried, weighed, threshed and the grain weighed. All intercropped crops were threshed together and then separated into legume and non-legume grains. Barley and pea seed are similar in sizes and separation of the two seeds resulted in potential large losses of one of the two crops. Only the grains of the barley/pea intercrop from Glenavon and Canora were separated; barley/pea crops from the other sites were not separated and were analyzed together. Grain was analyzed for total N using standard methods (Bremner and Mulvaney, 1982).

The Land Equivalent Ratio (LER) was calculated as follows:

$$\text{LER} = \frac{\text{yield of intercropped legumes}}{\text{yield of monocropped legumes}} + \frac{\text{yield of intercropped non-legumes}}{\text{yield of monocropped non-legumes}}$$

Table 1. Cropping systems, seeding rate and grain prices.

| Cropping system | | Seeding rate (kg/ha) | | Price quoted ($/100 kg) | |
|---|---|---|---|---|---|
| Non-legume | Legume | Non-legume | Legume | Non-legume | Legume |
| | | ***Variety Trial***[†] | | | |
| Canola-Westar | - | 6.7 | - | 32.76 | - |
| Canola-Tobin | - | 6.7 | - | 32.76 | - |
| Yellow Mustard-Tilney | - | 9.0 | - | 44.10 | - |
| Barley-Argyle | - | 78 | - | 12.29 | - |
| - | Pea-Trapper | - | 149 | - | 22.42 |
| - | Pea-Tipu | - | 159 | - | 23.15 |
| - | Pea-Maple | - | 149 | - | 24.42 |
| - | Pea-Victoria | - | 149 | - | 24.42 |
| - | Pea-Princess | - | 149 | - | 24.42 |
| - | Pea-Tara | - | 159 | - | 24.42 |
| Canola-Westar | Pea-Trapper | 3.4 | 62 | 32.76 | 22.42 |
| Canola-Westar | Pea-Tipu | 3.4 | 78 | 32.76 | 23.15 |
| Canola-Westar | Pea-Maple | 3.4 | 78 | 32.76 | 24.42 |
| Canola-Westar | Pea-Victoria | 3.4 | 62 | 32.76 | 24.42 |
| Canola-Tobin | Pea-Trapper | 3.4 | 62 | 32.76 | 22.42 |
| Canola-Tobin | Pea-Victoria | 3.4 | 62 | 32.76 | 24.42 |
| Canola-Tobin | Pea-Princess | 3.4 | 62 | 32.76 | 24.42 |
| Yellow mustard-Tilney | Pea-Trapper | 4.5 | 62 | 44.10 | 22.42 |
| Yellow mustard-Tilney | Pea-Tipu | 4.5 | 78 | 44.10 | 23.15 |
| Yellow mustard-Tilney | Pea-Maple | 4.5 | 78 | 44.10 | 24.42 |
| Yellow mustard-Tilney | Pea-Victoria | 4.5 | 62 | 44.10 | 24.42 |
| Barley-Argyle | Pea-Trapper | 39 | 62 | 12.29 | 22.42 |
| Barley-Argyle | Pea-Tara | 39 | 78 | 12.29 | 24.42 |
| Barley-Argyle | Pea-Tipu | 39 | 78 | 12.29 | 23.15 |
| | | ***Seeding Rate Trial***[‡] | | | |
| - | Pea-Trapper, 100% | - | 149 | - | 22.42 |
| Canola-Westar, 25% | Pea-Trapper, 75% | 1.7 | 108 | 32.76 | 22.42 |
| Canola-Westar, 50% | Pea-Trapper, 50% | 3.4 | 62 | 32.76 | 22.42 |
| Canola-Westar, 75% | Pea-Trapper, 25% | 5.0 | 31 | 32.76 | 22.42 |
| Canola-Westar, 100% | - | 6.7 | - | 32.76 | 22.42 |
| - | Pea-Trapper, 100% | - | 149 | - | - |
| Barley-Argyle, 25% | Pea-Trapper, 75% | 20 | 108 | 12.29 | 22.42 |
| Barley-Argyle, 50% | Pea-Trapper, 50% | 39 | 62 | 12.29 | 22.42 |
| Barley-Argyle, 75% | Pea-Trapper, 25% | 61 | 31 | 12.29 | 22.42 |
| Barley-Argyle, 100% | - | 78 | - | 12.29 | 22.42 |

[†]Sites at Glenavon and Star City

[‡]Sites at Glenavon, Melville, Canora and Star City

## RESULTS AND DISCUSSION

### Variety Trial

Germination of all crops at Glenavon was satisfactory, but at Star City canola and mustard only germinated after the arrival of the first rain, six weeks after seeding. The severe drought during the spring and summer of 1988 reduced grain yield significantly below the reported long term average for some crops, especially canola, barley, and mustard (Tables 2 and 3). In contrast, pea sustained yield at a level comparable with the long term average of 1695 kg/ha. The indeterminate growth habit of pea allowed it to take advantage of later rains. However, large differences among pea varieties in grain yield were observed. At Glenavon the monocropped Trapper and Tara produced grain yields of 2043 and 1931 kg/ha, respectively, monocropped Princess only showed a grain yield of 952 kg/ha. Intercropping legumes or non-legumes reduced yield of both crops but the reduction was not the same for all intercropping combinations tested. For example, at Glenavon, grain yield of intercropped barley was only slightly reduced as compared with the grain yield of monocropped barley. However, grain yield of intercropped pea with barley was severely reduced (Table 2). At both sites and for none of the intercropping systems tested, the LER were not significantly higher than 1, indicating that no beneficial yield increases were observed due to intercropping. However, significant differences in the total economic return for grain of the different cropping systems were observed (Tables 2 and 3). The value for the different crops are listed in Table 1 and are based upon prices quoted for the different grains by the Saskatchewan Wheat Pool on September 26, 1988. None of the intercropping systems significantly increased the $/ha return above those received for monocropping systems. At Glenavon, the highest return was found for monocropped Tara, $392/ha, whereas monocropped Tobin showed the lowest return, i.e. $106/ha. For Star City, those figures were $472/ha for monocropped Tara and $182/ha for monocropped Westar.

Significant differences in total grain-N accumulation per ha were present between the various cropping systems. At Glenavon, the highest total N/ha was found for monocropped Trapper at 57.2 kg N/ha, the lowest for intercropped barley/Tara at 21.5 kg N/ha (Table 2). For Star City the highest N-yielding cropping system was monocropped Trapper, 65.6 kg N/ha, the lowest monocropped Westar, 17.7 kg N/ha (Table 3). Furthermore at Glenavon, intercropping barley with pea did not increase total N as compared with monocropped barley. At Star City, intercropping barley with Trapper increased total N almost by one-third over monocropped barley but no such an increase was observed when barley was intercropped with Tara or Tipu. With the seeding rates used it appears that only the highest yielding pea variety, (Trapper) might be able to increase total N or total protein content of the intercropped barley/pea system.

Overall, the percentage of N in intercropped pea at Glenavon is lower than in monocropped pea, especially when intercropped with Westar. At Star City, where the canola or mustard germinated 5 to 6 weeks later than pea, the percentage of N in the intercropped legume and non-legume were higher, albeit not significantly, or similar to those of monocropped species. This would suggest that at Glenavon, where the two species were competing simultaneously for available soil and fertilizer-N, the non-legume utilized available N more effectively than the legume and that pea was not able to increase its $N_2$-fixation activity to counterbalance its reduced N availability. At Star City, the growth of the non-legume mostly occurred after pea had flowered and was in the ripening stage. Under these circumstances, the number of plants per unit area competing for available N was about half of those found in Glenavon resulting in a higher amount of available N per plant. This may have lead to higher percentage of N in the intercropped non-legumes as compared with the monocropped non-legumes.

Table 2. Yield, total N, and economic return of intercropped pea with canola, mustard or barley at Glenavon.

| Cropping system | Total dry weight (kg/ha) | Grain (kg/ha) | | | % N | | Grain N (kg/ha) | | | LER yield | $ HA |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Non-legume | Legume | Total | Non-legume | Legume | Non-legume | Legume | Total | | |
| Westar | 1789 | 567 | - | 567 | 4.30 | - | 25.0 | - | 25.0 | 1.00 | 186 |
| Tobin | 1104 | 323 | - | 323 | 4.20 | - | 13.6 | - | 13.6 | 1.00 | 106 |
| Mustard | 1538 | 565 | - | 565 | 5.68 | - | 32.2 | - | 32.2 | 1.00 | 249 |
| Barley | 2394 | 1062 | - | 1062 | 2.13 | - | 22.5 | - | 22.5 | 1.00 | 131 |
| Trapper | 2543 | - | 1556 | 1556 | - | 3.68 | - | 57.2 | 57.2 | 1.00 | 349 |
| Tipu | 2422 | - | 1238 | 1238 | - | 3.36 | - | 41.7 | 41.7 | 1.00 | 287 |
| Maple | 2497 | - | 1342 | 1342 | - | 4.09 | - | 55.6 | 55.6 | 1.00 | 328 |
| Victoria | 1936 | - | 1319 | 1319 | - | 3.55 | - | 46.8 | 46.8 | 1.00 | 322 |
| Princess | 1469 | - | 952 | 952 | - | 3.01 | - | 29.0 | 29.0 | 1.00 | 233 |
| Tara | 2552 | - | 1605 | 1605 | - | 3.34 | - | 52.5 | 52.5 | 1.00 | 392 |
| Westar/Trapper | 2065 | 285 | 674 | 959 | 4.62 | 3.52 | 13.0 | 23.7 | 36.7 | 0.91 | 245 |
| Westar/Tipu | 2151 | 279 | 576 | 854 | 4.53 | 3.42 | 12.5 | 19.9 | 32.4 | 0.96 | 225 |
| Westar/Maple | 2407 | 175 | 1043 | 1218 | 4.34 | 3.77 | 7.6 | 39.4 | 47.0 | 1.11 | 312 |
| Westar/Victoria | 2177 | 277 | 823 | 1100 | 4.45 | 3.36 | 12.1 | 28.1 | 40.2 | 1.10 | 292 |
| Tobin/Trapper | 2070 | 82 | 1051 | 1133 | 4.35 | 3.64 | 3.6 | 38.5 | 42.0 | 0.96 | 255 |
| Tobin/Victoria | 1449 | 190 | 544 | 734 | 4.24 | 3.26 | 8.1 | 17.9 | 25.9 | 1.10 | 195 |
| Tobin/Princess | 1387 | 114 | 628 | 742 | 4.14 | 3.12 | 4.7 | 20.0 | 24.7 | 1.03 | 191 |
| Mustard/Trapper | 2147 | 468 | 556 | 1024 | 5.77 | 3.41 | 26.9 | 18.8 | 45.7 | 1.22 | 331 |
| Mustard/Tipu | 2042 | 396 | 430 | 826 | 5.71 | 3.35 | 22.7 | 15.0 | 37.6 | 1.05 | 300 |
| Mustard/Maple | 1912 | 319 | 541 | 860 | 5.61 | 3.58 | 17.9 | 19.3 | 37.3 | 1.00 | 306 |
| Mustard/Victoria | 1688 | 410 | 361 | 770 | 5.31 | 3.25 | 21.8 | 11.8 | 33.5 | 1.00 | 229 |
| Barley/Trapper | 2157 | 858 | 134 | 992 | 2.00 | 3.40 | 17.3 | 4.4 | 21.7 | 0.88 | 135 |
| Barley/Tara | 2375 | 913 | 89 | 1002 | 2.07 | 3.44 | 18.4 | 3.1 | 21.5 | 0.92 | 134 |
| Barley/Tipu | 2290 | 937 | 88 | 1025 | 2.08 | 3.19 | 20.0 | 2.8 | 22.7 | 0.95 | 137 |
| LSD <0.05 | | | | | | 0.46 | | | 13.0 | NS | 86 |

Table 3. Yield, total N, and economic return of intercropped pea with canola, mustard or barley at Star City.

| Cropping system | Total dry weight (kg/ha) | Grain (kg/ha) | | | % N | | Grain N (kg | | | LER | $ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Non-legume | Legume | Total | Non-legume | Legume | Non-legume | Legu | Total | yield | HA |
| Westar | 2330 | 556 | - | 556 | 3.20 | - | 17.7 | | 17.7 | 1.00 | 182 |
| Tobin | 2128 | 655 | - | 655 | 3.42 | - | 22.4 | | 22.4 | 1.00 | 214 |
| Mustard | 2557 | 517 | - | 517 | 4.76 | - | 24.8 | | 24.8 | 1.00 | 228 |
| Barley | 3195 | 1699 | - | 1699 | 2.05 | - | 34.8 | | 34.8 | 1.00 | 209 |
| Trapper | 3504 | - | 2043 | 2043 | - | 3.23 | - | 65 | 65.6 | 1.00 | 458 |
| Tipu | 3952 | - | 1871 | 1871 | - | 3.01 | - | 56 | 56.0 | 1.00 | 433 |
| Maple | 3593 | - | 1615 | 1615 | - | 3.25 | - | 52 | 52.7 | 1.00 | 394 |
| Victoria | 2373 | - | 1473 | 1473 | - | 3.29 | - | 48 | 48.1 | 1.00 | 360 |
| Princess | 2234 | - | 1326 | 1296 | - | 3.25 | - | 42 | 42.5 | 1.00 | 324 |
| Tara | 3317 | - | 1931 | 1931 | - | 3.08 | - | 59 | 59.4 | 1.00 | 472 |
| Westar/Trapper | 2977 | 132 | 1293 | 1425 | 3.65 | 3.31 | 4.7 | 42 | 46.8 | 0.88 | 333 |
| Westar/Tipu | 3047 | 281 | 949 | 1230 | 3.69 | 3.45 | 10.3 | 32 | 42.9 | 1.16 | 312 |
| Westar/Maple | 2806 | 149 | 1103 | 1252 | 3.57 | 3.30 | 5.2 | 36 | 41.4 | 0.96 | 318 |
| Westar/Victoria | 2826 | 336 | 618 | 954 | 3.39 | 3.42 | 11.3 | 20 | 31.8 | 1.06 | 261 |
| Tobin/Trapper | 3161 | 216 | 1348 | 1564 | 3.47 | 3.32 | 6.9 | 43 | 50.6 | 1.05 | 353 |
| Tobin/Victoria | 2701 | 370 | 839 | 1209 | 3.80 | 3.35 | 14.1 | 27 | 41.9 | 1.15 | 326 |
| Tobin/Princess | 2856 | 422 | 854 | 1276 | 3.69 | 3.10 | 15.6 | 26 | 41.9 | 1.36 | 347 |
| Mustard/Trapper | 3326 | 146 | 1363 | 1509 | 5.28 | 3.31 | 7.7 | 44 | 52.2 | 0.97 | 370 |
| Mustard/Tipu | 3172 | 279 | 905 | 1184 | 5.39 | 3.30 | 15.0 | 29 | 44.9 | 1.24 | 360 |
| Mustard/Maple | 2973 | 154 | 1023 | 1178 | 5.14 | 3.17 | 7.7 | 32 | 39.8 | 0.94 | 373 |
| Mustard/Victoria | 3131 | 291 | 1035 | 1326 | 5.48 | 3.01 | 16.2 | 31 | 47.4 | 1.42 | 321 |
| Barley/Trapper | 3197 | - | - | 1597† | 2.72‡ | - | - | | 43.6‡ | 1.00 | |
| Barley/Tara | 3120 | - | - | 1650 | 2.28 | - | - | | 37.4 | 1.00 | |
| Barley/Tipu | 3495 | - | - | 1785 | 2.13 | - | - | | 37.8 | 1.00 | |
| LSD <0.05 | | | | | | NS | | | 15.0 | NS | 110 |

†Barley and pea grain were not separated

‡% N of barley/pea mixture

From the two variety trials the conclusion can be drawn that monocropped pea, especially Tara, are the most economic crops to growth. Intercropping did not enhance the economic return.

### Seeding Rate Trials

Grain yield varied considerably between the four sites (Tables 3, 4 and 5). At Melville grain yield of monocropped Trapper pea averaged 2363 kg/ha (Table 4), at Canora the monocropped pea showed an average grain yield of only 899 kg/ha (Table 5). Similar results were found for canola and barley where the highest yields were observed at Melville and the lowest at Canora. Severe drought conditions prevailed at all sites excepts Melville. Furthermore, yield was reduced at Canora due to weed competition.

At Glenavon, Canora and Melville, the highest economic return was found for monocropped Trapper while the lowest return was for monocropped barley or canola. At Star City, however, the highest economic return was observed for the canola 25% - Trapper 75% seeding combination, $465/ha, which was significantly higher than the $387/ha for monocropped Trapper or $224/ha for monocropped canola (Table 5). At this site the same germination pattern as found in the variety trial occurred and where the pea was already flowering before canola germinated. It is unclear if this can explain the higher economic return for this particular seeding ratio because the grain yield of canola was only 12% of monocropped canola which averaged 684 kg/ha, about half of the long term average.

Large differences in total grain N/ha in the various cropping systems between the sites were observed (Tables 4 and 5). At Melville the monocropped pea produced a total N yield of 99.3 kg/ha, monocropped canola only had a total N yield of 19.2 kg/ha. Overall, the highest N yield was observed for monocropped pea, the lowest for monocropped barley and canola with the various intercroppings showing intermediate values. At Star City, intercropping barley with pea significantly increased total N as compared with the monocropped barley. An increase in total N in the 25% barley - 75% pea cropping system of 11.3 and 3.2 kg/ha was found at Melville and Glenavon, but the increase was not significant at $P < 0.05$. From this study it appears that higher total N in intercropping systems are possible under certain conditions but the barley/pea ratio should favor the pea component.

The percentage of N of the intercropped barley at Canora and Glenavon increased significantly when intercropped with pea. Data provided for the other sites are the percentage of N of the pea/barley mixture and therefore it is unknown what the percentage of N of the two individual crops are. At all the four sites, the percentage of N in the intercropped pea decreases as compared with monocropped pea. However,in this experiment the differences were not significant at the $P < 0.05$ level. The decrease in the percentage of N in pea may partially explain the absence of a significant increase in total N in the intercropping system.

## CONCLUSIONS

Intercropping pea with barley, canola or mustard did not give a higher economic return than monocropped pea but it did produce a higher economic return than monocropped non-legumes. Similar results were obtained for total N. At both sites monocropped Tara-pea was the most economically beneficial and Trapper-pea showed the highest total N yield. Intercropping did not significantly increase the Land Equivalent Ratio. However, the data were derived from small plot experiments which were hand

Table 4. Yield and total N of intercropped pea and canola or barley at different seeding rates at Glenavon and Melville.

| Cropping system | Total dry weight (kg/ha) | Grain (kg/ha) | | % N | | Grain N (kg/ha) | | $ HA |
|---|---|---|---|---|---|---|---|---|
| | | Non-legume | Legume | Non-legume | Legume | Non-legume | Legume | |
| ***Glenavon*** | | | | | | | | |
| Trapper, 100% | 2108 | - | 1331 | - | 3.62 | - | 48.5 | 299 |
| Westar, 25% - Trapper, 75% | 2205 | 86 | 1135 | 4.46 | 3.45 | 3.8 | 39.9 | 283 |
| Westar, 50% - Trapper, 50% | 2387 | 195 | 1071 | 4.45 | 3.45 | 8.7 | 37.0 | 304 |
| Westar, 75% - Trapper, 25% | 2377 | 309 | 835 | 4.46 | 3.17 | 13.8 | 27.2 | 288 |
| Westar, 100% | 1333 | 434 | - | 4.43 | - | 19.2 | - | 142 |
| LSD <0.05 | | | | NS | NS | | | 48 |
| Trapper, 100% | 2187 | - | 1327 | - | 3.27 | - | 43.3 | 297 |
| Barley, 25% - Trapper, 75% | 2703 | 467 | 368 | 2.19 | 3.42 | 10.2 | 12.6 | 140 |
| Barley, 50% - Trapper, 50% | 2324 | 472 | 88 | 2.05 | 3.15 | 9.7 | 2.7 | 78 |
| Barley, 75% - Trapper, 25% | 2219 | 467 | 89 | 2.01 | 3.36 | 9.4 | 3.0 | 77 |
| Barley, 100% | 2374 | 957 | - | 2.06 | - | 19.7 | - | 118 |
| LSD <0.05 | | | | 0.10 | NS | | | 48 |
| ***Melville*** | | | | | | | | |
| Trapper, 100% | 5443 | - | 2363 | - | 4.21 | - | 99.3 | 577 |
| Westar, 25% - Trapper, 75% | 5955 | 524 | 1495 | 4.20 | 3.88 | 22.1 | 58.0 | 537 |
| Westar, 50% - Trapper, 50% | 5306 | 925 | 908 | 4.08 | 3.93 | 28.1 | 35.9 | 525 |
| Westar, 75% - Trapper, 25% | 4975 | 1114 | 675 | 4.28 | 3.75 | 47.5 | 24.9 | 530 |
| Westar, 100% | 4177 | 1337 | - | 4.41 | - | 59.2 | - | 438 |
| LSD <0.05 | | | | NS | NS | | | NS |
| Trapper, 100% | 5686 | - | 2312 | - | 3.96 | | 90.4 | 565 |
| Barley, 25% - Trapper, 75% | 5199 | 2042 | - | 3.70 | - | 73.0 | - | - |
| Barley, 50% - Trapper, 50% | 5460 | 2434 | - | 2.67 | - | 62.6 | - | - |
| Barley, 75% - Trapper, 25% | 5533 | 2528 | - | 2.42 | - | 60.6 | - | - |
| Barley, 100% | 5959 | 2788 | - | 2.25 | - | 61.7 | - | 343 |
| LSD <0.05 | | | | | | | | |

Table 5. Yield and total N of intercropped pea and canola or barley at different seeding rates at Canora and Star City.

| Cropping system | Total dry weight (kg/ha) | Grain (kg/ha) | | % N | | Grain N (kg/ha) | | | $ HA |
|---|---|---|---|---|---|---|---|---|---|
| | | Non-legume | Legume | Non-legume | Legume | Non-legume | Legume | Total | |
| ***Canora*** | | | | | | | | | |
| Trapper, 100% | 1835 | - | 899 | - | 3.42 | - | 31.0 | 31.0 | 202 |
| Westar, 25% - Trapper, 75% | 1821 | 371 | 314 | 4.11 | 3.38 | 15.8 | 10.9 | 26.7 | 192 |
| Westar, 50% - Trapper, 50% | 2029 | 314 | 489 | 3.95 | 3.31 | 12.5 | 16.8 | 29.3 | 212 |
| Westar, 75% - Trapper, 25% | 1574 | 402 | 511 | 3.77 | 3.24 | 15.6 | 16.9 | 32.4 | 246 |
| Westar, 100% | 1102 | 444 | - | 3.88 | - | 17.2 | - | 17.2 | 145 |
| LSD <0.05 | | | | NS | NS | | | NS | NS |
| Trapper, 100% | 1603 | - | 802 | - | 3.60 | - | 29.1 | 29.1 | 180 |
| Barley, 25% - Trapper, 75% | 1883 | 691 | 264 | 2.20 | 3.52 | 14.9 | 9.2 | 24.1 | 144 |
| Barley, 50% - Trapper, 50% | 2442 | 1289 | 151 | 1.87 | 3.21 | 24.2 | 4.6 | 28.8 | 192 |
| Barley, 75% - Trapper, 25% | 2965 | 1650 | 132 | 1.73 | 3.00 | 30.2 | 3.7 | 33.9 | 232 |
| Barley, 100% | 3025 | 1594 | - | 1.77 | - | 28.8 | - | 28.8 | 196 |
| LSD <0.05 | | | | 0.21 | NS | | | NS | NS |
| ***Star City*** | | | | | | | | | |
| Trapper, 100% | 3546 | - | 1728 | - | 3.47 | - | 60.0 | 60.0 | 387 |
| Westar, 25% - Trapper, 75% | 3635 | 80 | 1956 | 3.30 | 3.24 | 2.6 | 63.4 | 66.0 | 465 |
| Westar, 50% - Trapper, 50% | 3275 | 73 | 1636 | 3.61 | 3.13 | 2.6 | 51.1 | 53.8 | 391 |
| Westar, 75% - Trapper, 25% | 3675 | 185 | 1548 | 3.37 | 3.09 | 6.2 | 47.9 | 54.1 | 408 |
| Westar, 100% | 2699 | 684 | - | 3.15 | - | 21.6 | - | 21.6 | 224 |
| LSD <0.05 | | | | NS | NS | | | 11.8 | 66 |
| Trapper, 100% | 3716 | - | 1822 | - | 3.15 | - | 57.4 | 57.4 | 409 |
| Barley, 25% - Trapper, 75% | 3880 | 1903 | - | 2.62 | - | 50.0 | - | 50.0 | - |
| Barley, 50% - Trapper, 50% | 3563 | 1894 | - | 2.35 | - | 44.2 | - | 44.2 | - |
| Barley, 75% - Trapper, 25% | 3225 | 1750 | - | 2.21 | - | 38.2 | - | 38.2 | - |
| Barley, 100% | 2902 | 1619 | - | 2.16 | - | 34.7 | - | 34.7 | 199 |
| LSD <0.05 | | | | | | | | 11.8 | |

harvested. Lodging can be a major problem for farmers and substantial losses can occur during mechanical harvest; no such losses were present in this experiment. Lodging of pea was substantially reduced, especially when intercropped with mustard or Westar canola.

In the seeding rate trial, a seeding ratio of 25% barley/75% pea at three sites resulted in an increase in total N (at one site significantly) over monocropped barley. Only a seeding ratio which favors the pea component appeared to be able to increase the total N content of the mixture. In view of the high total N content of the monocropped pea, this seems logical.

No economic consideration is given to the benefit of facilitated harvest procedures, a higher quality pea product free of soil and other contaminants which might become crucial when the pea crop is sold for human consumption, and reduced diseases and pests. However, it is difficult to put a price tag on those parameters and the benefit would probably vary from year to year. The extent to which intercropping will be practiced in the coming years in Saskatchewan will be difficult to predict.

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